STRUCTURE OF THE TOPOGRAPHIC MAPS OF RUMP HUNGARY

(From the Hungarian, Periodical- Cartography Gazette)

TERKEPESZETI KOZLONY, Oct 1952

3 July 1951

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STRUCTURE OF THE TOPOGRAPHIC MAPS OF RUMP HUNGARY

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At present, Hungarian topographic maps consist of sheets in part originating in Vienna and in part produced recently. The old and new maps show a difference from one another not only in appearance, but also in construction.

The division of the sheets is essentially identical, but the method of graphic representation is entirely different. In the old maps the polyhedric system was employed, that is, each sheet was laid out on an independent cartographic plane. As a result they form, together, a multiplane solid.

On the other hand, in the new maps the stereographic projection is employed, that is, all sheets are laid out on the same plane. The numerical points are determined in the polyhedric system by geographic coordinates and in the stereographic projection by rectangular coordinates. (1) These base points are placed in the polyhedric system into the geographic grid and in the stereographic projection into the rectangular grid of the plane.

In practice, however, this principle is frequently modified. With a view to economy in time, labor, and expense, simplifications and approximations are made similar to ours. They do not affect the reliability of the map.

MAPS IN GEOGRAPHIC DEGREES ORIGINATING IN VIENNA (2)

The Hungarian maps originating in Vienna were made during the third surveying of the area of the former Austro-Hungarian Monarchy (1869-87). This surveying was based on the triangulation grid begun in 1806. Beginning with 1806, military triangulation in the

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whole monarchy was related to a single axis and zone grid, based on the location of St. Stephen's Dome in Vienna (rectangular topographic zones).

With the introduction of cadastral surveying, ten different plane coordinate systems came to be used, and topographic surveys adopted these systems in order to make use of the results of the cadastral survey without difficulty. (3) However, since the interrelation of the bases of these different systems was not determined accurately, combination of the cadastral surveys with different base points resulted in difficulties which made the uniformity of the topographic surveys questionable. For this reason, the Military Geographic Institute abandoned the previous plane system and substituted for it in 1876 the zoning system, which is still in use. The purpose of the introduction of the new system was to unify the various plane coordinate systems on an ellipsoidlike curved surface.

In theory, the Bessel ellipsoid may be imagined by assuming that its surface is composed of an infinitely great number of planes, each bounded by two meridian, or parallel, circles which are infinitely close to one another.

In practice, the degree of approximation, that is, the scale of the constituent planes, may be selected in proportion to the accuracy expected.

Each constituent plane is bounded by the corresponding parts of the grid. Their representation on the plane of the map is the characteristic of the system, the so-called frame. After numbering the degree grid, this frame constitutes the first step in representation, as well as the basis for determining the triangulation points.

The structure of the maps is based on this concept. In drawing

a map, partly rectangular topographic zones of previous origin, partly cadastral survey results, and partly triangulation data are employed.

Frame Construction. The structure of the map was based on the frame. The scales of these frames were summarized in a table, according to zones of latitude, on the basis of calculations of the Bessel ellipsoid published in the Berliner Astronomisches Jahrbuch of 1952.

The method of construction is represented in diagram 1, in which the Roman numerals indicate the sequence of the lines. The hypotenuse indicated by V. was used for checking purposes.

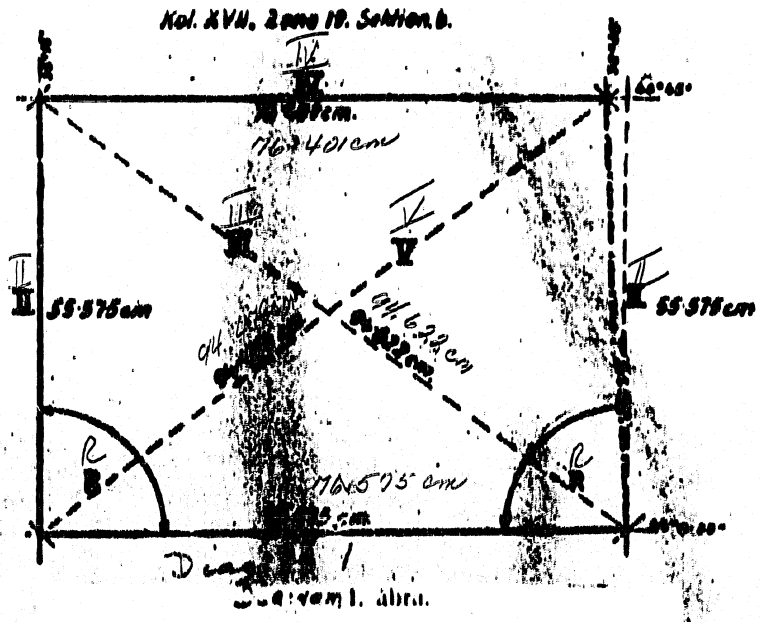


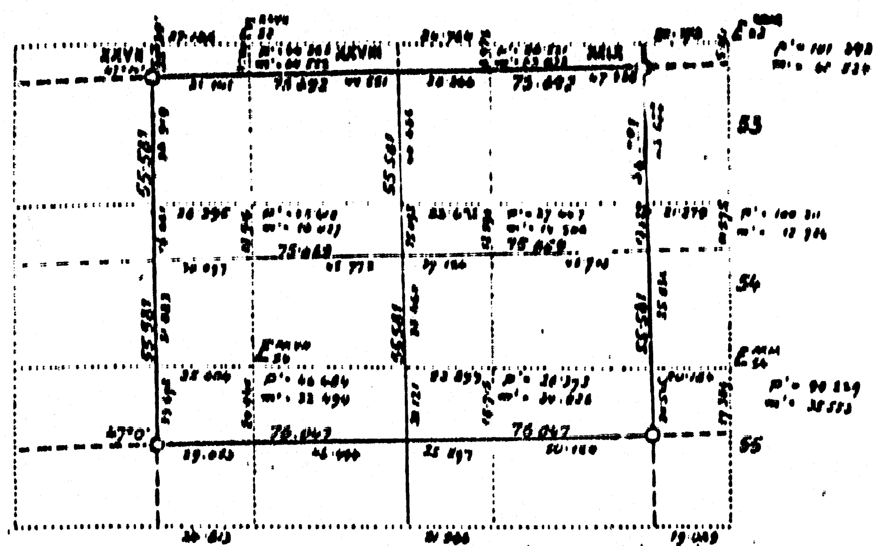
Diagram 1.

Expansion of the Construction.

a) For the employment of an older survey (with rectangular topographic zones). The intersections of the old rectangular

topographic-zone lines were calculated on the latitudinal and longitudinal circles of the new grid frame, so that the old zones which were included in the new frame could be identified accurately and the points based on the Cassini coordinates could be determined. (Diagram #2)

Gradkartenblatt Nº XVIII, 17



adatok cm.-ben. Data in centimeters
Diagram 2. ábra.

b) [illegible] cadastral surveying: the geographic coordinates of the intersecting points ("E" points) of the cadastral zone lines which fall into the vicinity of the new grid frame were calculated by means of the Puissant formulas. By comparing the "E" points with the geographic coordinates of the center of the topographic map, the length of the arcs was converted into linear measurement by means of a simple table. By this method, the plane coordinates (p, m) for at least four "E" points in reference to the cross formed by the axes of the topographic map were obtained in each zone. After these coordinates were drawn, the cadastral zone grid could be drawn and the cadastral points (P, λ, Y) could be determined. (Diagram 3a.)

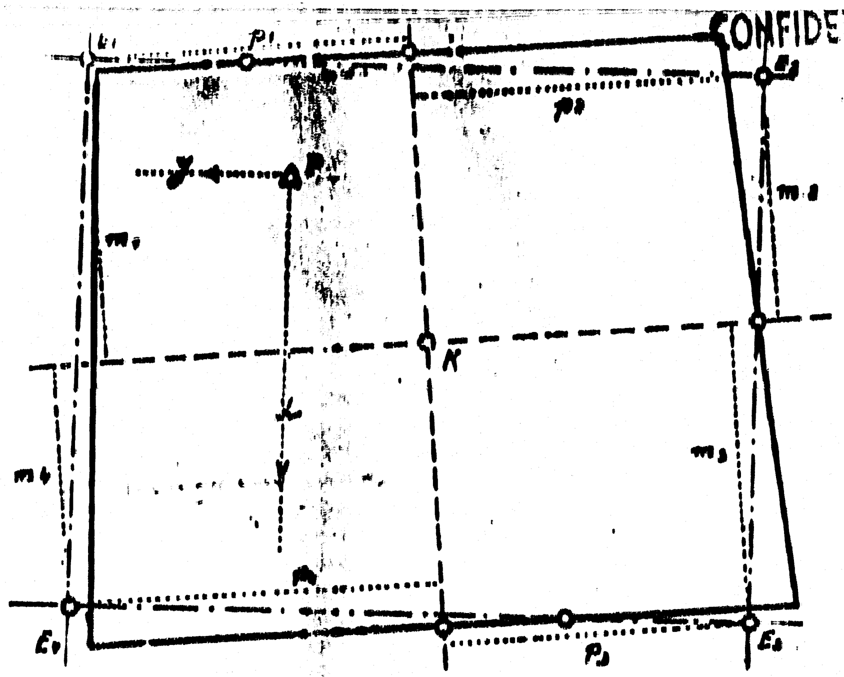
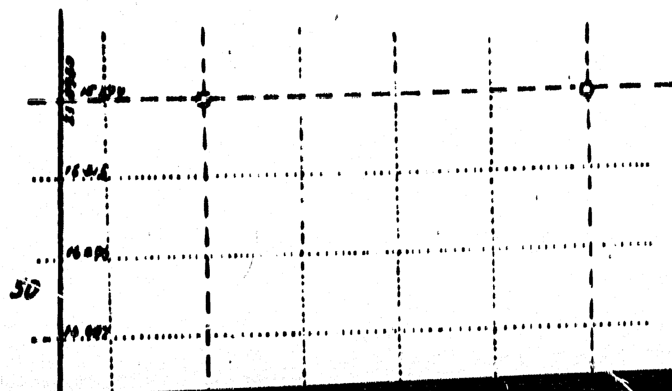


Diagram 3a

For purposes of photographing, the intersections of the meridians and parallels in each cadastral zone were also calculated (Diagram 3b)

Részlet a Gradienblat .XVII.20. szerkesztési lapjáról.



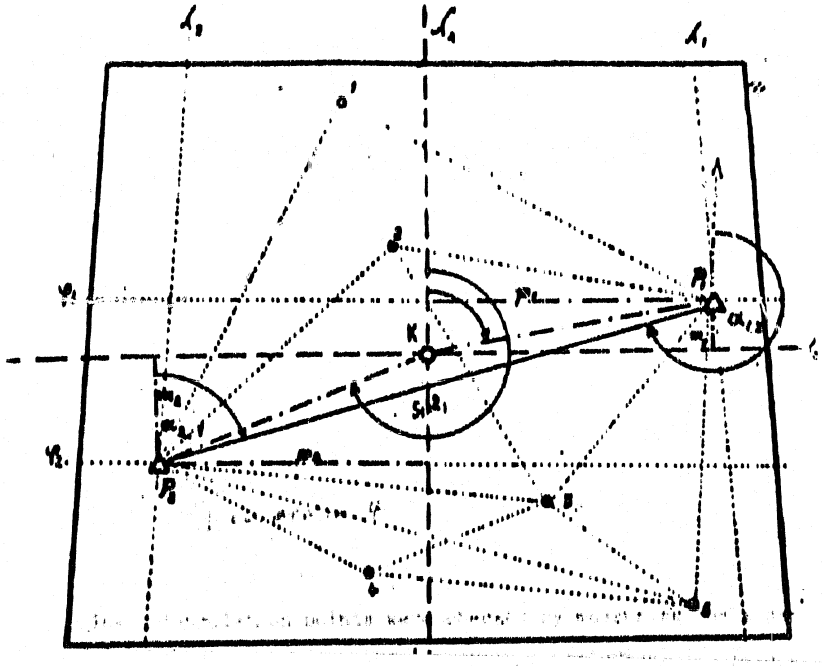
[redacted]

c) For Surveying without Auxiliary Material, or for Representation on Larger Scales. The prerequisite was a point determined by two

ye-graphic coordinates (x_1, x_2) for each sheet. After [illegible] the coordinates of these two points were computed in relation to the cross formed by the axes of the sheet (x_m, y_m), a check was made by calculating the distance between the two points ($b_{1,2}$) and the azimuth enclosed between the side in question and the cross formed by the axes (α_{1-2}).

With the aid of the base line thus obtained (S 1, 2), and on the basis of the grid data, the plane coordinates for the triangulation points in reference to the cross formed by the axes of the sheet (y_m, x_m) could be calculated. As a result, the points could be determined. (Diagram 4)

Diagram 4



The triangulation points were checked by measuring the sides. This effective control was possible since only 30 [illegible] points were included in any one of the zones surveyed, and the length of each side was available in the table.

The sheets were constructed according to zones. The zone was

cut into surveying quarters only after graphic triangulation on a large scale, and after the detailed surveying it was pasted together again.

On the basis of the foregoing, the principle of the polyhedric system was not employed purely in the third topographic survey. This was done only after 1901 in the course of the fourth, or so-called accurate and detailed, surveying, because by that time the structure and calculation of the new, uniform military triangulation grid had been developed. However, Hungary was not included in the fourth surveying project.

Construction of the Kilometer Grid. The topographic surveying was done on a scale of 1:25,000, although the object was to have a manuscript for the drawing of a detailed map on a scale of 1:75,000. The original survey was not suitable for reproduction because of the use of colored pencils. Nevertheless, under the pressure of the enormously increased technical demands of the war, the Vienna institute was compelled to reproduce these original surveying zones and even to add a kilometer grid to them.

However, these grids were independent of the triangulation and were identified by conventional numbering as detailed maps with a stereographic grid related to the common system of coordinates.

It is, nevertheless, possible to transfer onto a map in geographic degrees any plane grid, including, as in our case, a stereographic kilometer grid, so that it will be related to a single system of plane coordinates throughout all sheets.

The method may be either numerical or graphic. In the former case the method described under b) above in connection with the employment of cadastral zones is employed. In graphic representation, certain landmarks (e.g., churches) are selected, which coincide exactly with the points determined by the plane coordinates, and the

grid represented in diagram 5 is drawn with their aid.

75,000-Scale Maps. The 1:75,000 detailed map published in Vienna is identical with the original surveying map, aside from a reduction in scale and the consequent cartotechnical generalisations. It remains only to mention that, beside the frame, the kilometer grid is included by the State Cartographic Institute in the 1:75,000 scale maps. This grid is, however, obtained by the graphic reconstruction described in the foregoing. Since it is not very accurate, it may be used only for general information.

The New 25,000 and 75,000 Maps

After the collapse of the monarchy, the legacy of the former Royal and Imperial Military Cartographic Institute of Vienna was taken over by the State Cartographic Institute.

Since the largest part of the cartographic material was obsolete, modernization was begun, first, by inspecting the areas of the original surveys and by revising the 1:75,000 maps. Later, a new topographic and photogrammetric survey was carried out.

For correcting the old maps and carrying out a new survey, the triangulation grid of the Military Cartographic Institute of Vienna was of no value because, for lack of funds, its points, except the primary points, are not fixed and because the financial situation of the country does not permit further development of the grid. Nor would this have been judicious, since a complete triangulation grid is available which far exceeds the point density required by topographic work.

For this reason, relying on the triangulation grid of the cadastral surveys, the State Cartographic Institute has introduced the same stereographic projection system which had been employed

in cadastral surveys for approximately three-fourths of the area of the country.

As a result, the construction of the new maps shows a marked difference from that of the former maps. Pasted together, the sheets of the old, polyhedric maps formed a polyplane surface resembling the ellipsoid of the earth, while all sheets of the new maps lie on a single plane.

The stereographic plane is zoned in accordance with the zoning of the old 75,000 map, that is, by using the longitudes east of Ferro at intervals of 30' and latitudes at intervals of 15'. The degree grid (sheet frame) is projected stereographically and has, beyond the zoning, no further importance.

In comparing the new 25,000 stereographic zones with the corresponding old zones it will be seen that the two maps show a shift in relation to each other, although [redacted] the value of the degree grid of the frame is identical.

This phenomenon is due to the fact that the geographic coordinates of the base point — the eastern tower of the former Gellerthegy [Budapest] observatory — do not have the same values in the old and new maps.

The geographic coordinates of the base point, as geodesically derived from the triangulation grid of the Military Cartographic Institute of Vienna, were:

φ = 47° 29' 14" 93

λ = 36° 42' 51" 69 I.

This value was accepted by the cadastral surveying project for its own stereographic projection, and Gellerthegy has the same value (I.) in the older maps, that is, in the old degree grid.

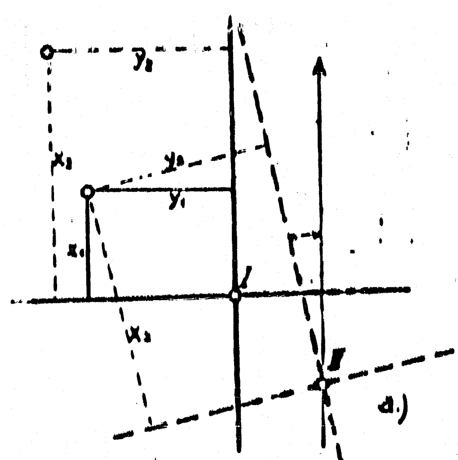
In introducing the cylindric projection in 1908, on the basis of astronomical observations from the Szechenyihegy /Budapest/ observatory, the value for the Gellerthegy base was determined as:

ϕ = 47° 29' 09" 6380
λ = 36° 42' 53" 5733 II.

The difference between the two values is:

In Arcs	In Fathoms	In Meters
$\Delta\phi$ 5" 2920	x = 86.5	164.0
$\Delta\lambda$ 1" [illegible]	y = 20.8	39.4

The State Cartographic Institute has accepted (for the calculation of the degree grid) the more recent and better value (II.). (4) For this reason, the Gellerthegy base appears with the value given under I above in the grade grid of the old maps and with a value indicated under II in the grade grid of the new maps. As a result the plane coordinates (x,y), related to different bases, of the grid intersections which have identical values in both maps cannot have the same value, but must deviate from each other by the differences indicated in the foregoing. (See diagram 6a.)



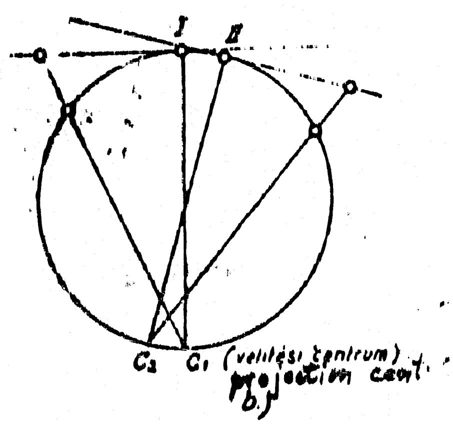


Diagram [illegible] Diagram 6b. abra.

By superimposing the coordinates of II (x_2, y_2) onto the cadastral, or kilometer, grid of I, the resulting grid will show a shift toward the north to a greater extent and toward the west to a lesser extent.

The axis meridians of the two systems will enclose a small angle and do not actually lie on the same projection plane. (Diagram 6b.) Nevertheless, the deviation may be imagined approximately as a parallel shift, that is, the value of the shift may be taken as constant. In superimposing the stereographic coordinates, reduced by the constants mentioned above (Δx = 154.0, y = 39.4), onto a kilometer grid reconstructed on a polyhedric sheet, it will be noticed that the intersecting points do not always coincide. This is due partly to uncertainties inherent in graphic representations and partly to the fact that the stereographic intersecting points fall on circles, while the intersections of polyhedric sheets, which are constructed on different principles, fall on the tangent of the center of the arc between two stereographic intersections. (Diagram 7.)

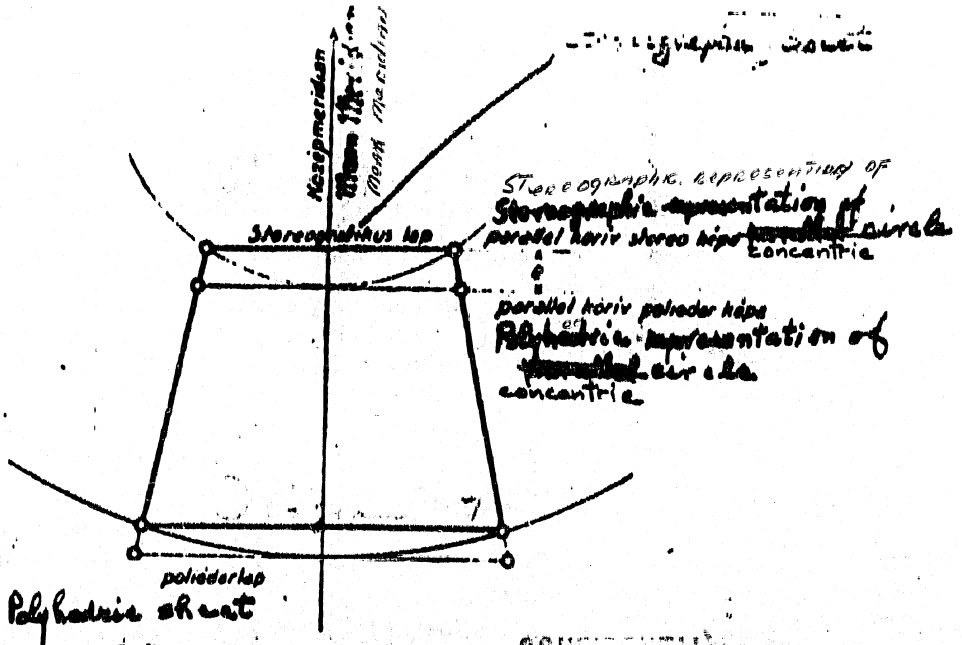


Diagram 7. übrig. -11- CONFIDENTIAL

For the longitudinal circles the deviation is unimportant, because the stereographic meridian representations are circles with radii approaching infinity (that is, the circles are nearly straight lines). On the other hand, the deviation is perceptible for the latitudinal circles. For example, it equals (on a scale of 1:5 000 000) e = 0.125 centimeter, corresponding to approximately 6 meters in the 47th Parallel. However, this distance is not constant, but increases toward the north - because the curvature of the parallels increases in this direction - and decreases toward the south.

The change in the structure of the new maps appears not only in the shift of the frame, but - as mentioned in the foregoing - also in the entirely different method of construction. The basis for the construction of polyhedric sheets was the frame, while, in the case of the new plane maps, the basis is a unified square grid, each side of which represents a distance of 1 kilometer (kilometer grid). After construction and numbering of this grid, both the triangulation points and the grid intersecting points with rectangular coordinates are superimposed thereon.

The construction is done with the aid of a coordinatograph, and the grid and the triangulation points are superimposed simultaneously. A check is made by the repeated measurement of the coordinates . The length of the sides cannot be used for checking purposes, because it is not available and its calculation would result in a considerable amount of additional work in view of the large number of points (sometimes 60 to 130 per sheet).

When the triangulation is given in the new cadastral cylindric projection, the intersections are calculated in the cylindric projection also. The points are traced in the zone grid of the

cylindric projection, and the position of the stereographic kilometer grid is identified afterward. (Diagram 8)

Data from Construction Sheets of the detailed 5159 Map
Részletek az 5159 részletes térkép szerkezeti lapjáról.

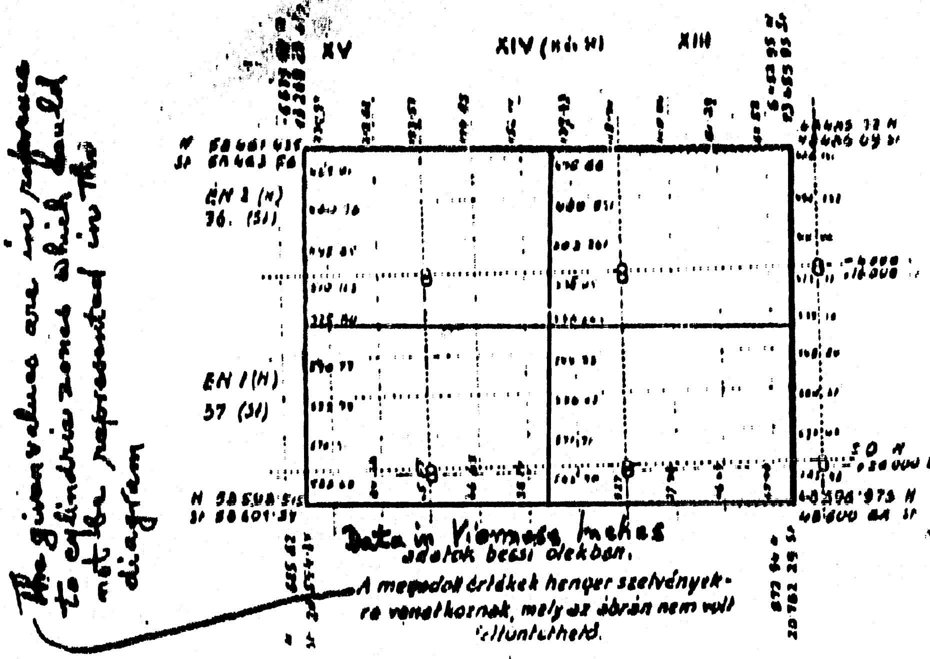


Diagram 8. ábra.

For the purpose of [illegible] the plane representation of the cadastral maps onto the topographic surface, the intersections of the cadastral zone lines together with the geographic circles (with sheet frames), are traced on the cadastral sheets on the basis of corresponding calculations, so that the corresponding parts of the grid may be traced on the cadastral maps. On the other hand, the cadastral grid is obtained on the topographic surface through conversion into fathoms and by interpolation, since the cadastral grid is exactly parallel to the kilometer grid.

Besides its constructive role, the kilometer grid has two other important functions. As an "indicator grid" it enables us to determine the points exactly without misunderstanding and also enhances the accuracy of mapping. If, for example, the original grid

which served as basis for the construction] is printed together with the plane representation without any change in the position of the points (plane representation) relative to the grid, irregularities due to photographing, pressure, or the displacement of the paper] must always be taken into account, with the understanding that the displacement is proportionate within each grid square. (Diagram 9.)

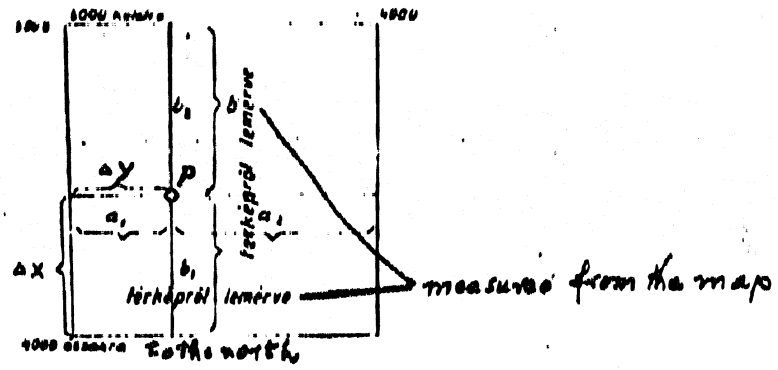


Diagram 9.

Correction per unit of lineal measurement $\frac{[(a_1' + a_2') - 1000]}{1000}$ or

$\frac{[(b_1 + b_2) - 1000]}{1000}$.

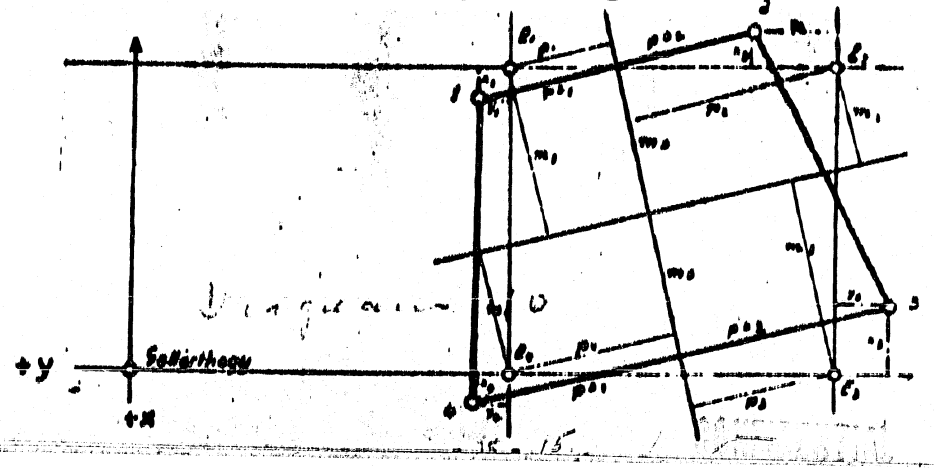
In solving the problems of structure of the new 75,000 maps, expediency was the decisive factor. (6) The principle was accepted that, in contrast to the new 25,000 sheets, the new 75,000 maps must adjoin the old maps as to areas accurately. The unity of this

highly important mapping project will thereby be assured and the old and new sheets may be used together without difficulty.

As explained in the foregoing, the intersections of the old and new maps do not coincide completely. For this reason, the principle that the new 75,000 sheets must adjoin the old sheets could be translated into practice only by making use of the data of the Vienna maps with certain modifications. These data relative to a considerable part of the country were available in the form described under b) in the first chapter above. The method of their utilization, however, is substantially different from the method previously described. Roughly speaking, it may be said that the Vienna construction works off the corresponding part from the cadastral plane and transferred it into the polyhedric frame. This method must be reversed by us, that is, the detached part of the plane, together with its grid frame, must be fitted back into its original place in the stereographic plane.

This operation was performed by using the construction data of each sheet (from the coordinates p, m of the "E" points in reference to the main axis of the sheet) to calculate, by means of coordinate transformation, the coordinates of the intersections (X, Y) of the polyhedric sheets in reference to the zone grid (1-4). (Diagram 10.)

DIAGRAM 10



In this case, the available data were transformed in accordance with the practice of the State Cartographic Institute since, because of the condition mentioned in the foregoing, projection calculation could not be employed.

Minor errors in the various sheets, as well as the divergence of the polyhedric zones, different results were obtained for each intersection, although the results showed only small differences. The end value is the arithmetic mean of these results.

Because of the method employed, this map, too, lies in a single plane, and all its intersections are determined by rectangle plane-coordinates. Its scale has become numerically greater relative to the Vienna table, but this increase is less than the scale of the graphic representation. Consequently, these maps adjoin the old material perfectly; that is, their frames coincide with those of the old maps. For the same reason, their frames, like those of the old maps, show a divergence in relation to the frames of the new 25,000 maps. In other words, the new 75,000 map does not coincide in area with the corresponding four new 25,000 zones.

The method of construction is similar to that of the survey map, with the difference that the kilometer grid is indicated in the frame by guide lines.

(1) Rectangular coordinates may be used also in the polyhedric system but, naturally, only for each sheet separately.

(2) The expression "Map in Geographic Degrees", [redacted] is used as an official term and not as the exact designation of the kind of map.

(3) The triangulation coordinates for several countries, including Hungary, were converted by the Cassini method into the Viennese system (based on St. Stephen's Dome).

(4) For reasons of expediency, the Institute has disregarded the difference of 6" 44 between stereographic and cylindric orientation and has retained the old orientation. (Therefore, Gellerthegy a = [redacted]

(5) If we compare two corresponding sheets -- disregarding their positions in space, their interrelation, and other factors --, only the point mentioned above of the parallel circle representations, produced according to the laws of the two projections, can be made to coincide.

(6) First of all, the available supply of old plates had to be preserved. Otherwise the change in method would have necessitated reproduction of this valuable material at a heavy cost.

[redacted] Gellerthegy [redacted]

[redacted]

[redacted] through [redacted])

191° 28' 52" 19 from south through west)

BRATISLAVE, PRAVDA
~~BRATISLAVA, PRAVDA~~, 29 MAY 51

AP ADMITS US USES BW -- Prague, Rude Pravo, 29 May 51

Hsin-hua announced in Peiping on 27 May that the American press agency [illegible] Associated Press had given further information on the use of Korean war prisoners for tests of bacteriological weapons.

This new American crime is being carried out on the decks of an American [illegible] near the island of Koje, 64 kilometers southwest of Pusan.

According to the AP report, the ship contains a modern laboratory completely equipped [illegible] incubators, microscopes, sterilizers, refrigerators, distillation [illegible], [illegible] all the tools which a scientist needs." This is the [illegible] ship on which similar crimes were committed in March of this year [illegible] [illegible]

The Associated Press announced that 3,[illegible]00 bacteriological tests are [illegible] [illegible] in the laboratory on the bodies of Korean prisoners.

AMERICANS COMMIT CRIMES AGAINST KOREAN PEOPLE — Prague, Lidove Noviny, 26 May

In addition to their use of force against women, children, and the aged, in addition to mass executions of war prisoners, in addition to the destruction of peaceloving cities, and other bestialities committed against the peaceloving Korean people, the American agressors have added recently bacteriological and chemical warfare. On 23 and 26 February and 3 March the Americans used poison gas on four different occasions in the region of the Han river, according to Novoye Vremya. On 6 March the Americans discharged poisonous weapons in the region of Kuriton, Liaison with the L. On 23 February American aircraft dropped bombs with poison gas on the village of Iri not far from the Han river. The periodical Newsweek described on 9 April the voyage of a "bubonic plague ship" to Wonsan harbor. According to the periodical the ship was used for testing the disastrous effects of bubonic plague bacilli on Chinese volunteer prisoners of war. Another proof is the report of Lt. Moss of the 24th American Artillery Division who stated that the American occupation troops often used poison gas weapons.

The Americans are not even satisfied with these means, however, in their bloodthirstyness. According to a report in the New York Herald Democratic Tribune, Representative Overton Brooks in a military committee of the House of Representatives demanded that atomic artillery weapons be used in Korea. The American imperialists hope that by using these most barbarous means they will be saved from the shameful end of their military adventure.

The American war criminals have wanted for a long time to use the atomic bomb in Korea. They were prevented in this, however, by the millions of signatures of the defenders of peace on the Stockholm petition.

AMERICANS OPERATE DEATH SHIP -- Prague, Pravo, 30 May 51

Not far from the Korean port of Pusan a ship is anchored. The American government has put it at the disposal of "scientists", and equipped it thoroughly from test tubes to incubators and refrigerators, and is waiting for the results of tests. It is waiting for the results of tests of bacteriological weapons. During the war The Japanese worked on these most disgusting and villainous weapons and therefore with complete justice the Soviet Union demanded the punishment of the war criminals who had been busy conducting bacteriological warfare. Today the Americans are continuing these most horrible crimes. Their tests are not conducted on corpses, but - on people. That's right, on people. Korean war prisoners are thrown to cruel, pitiless hangmen, who make up to 3,000 tests daily. The conceited, crude callousness of the Americans knows no bounds. The daily average of three thousand murders, completed or not completed, of sudden deaths or of slow killings, is perhaps an even worse record than that of the cruelty of the imperialist mercenaries in the enslaved country. "Scientists" and their assistants are killing the Korean people with vicious regularity; these "scientists" murder the people in their laboratories, test the effect of their preparations on them, and are happier the more horrible death becomes. Ilse Koch and the Nazi beasts have found someone to carry on their work.

A death ship is anchored near the port of Pusan, a ship which is a murder factory, an experimental laboratory for the mass annihilation of everything that is human. Those who ordered these tests and who are carrying them out are devoid of humanity. Their love for the dollar and

hatred for people has killed their humanity. But love for people must and will destroy these mass producers of death.